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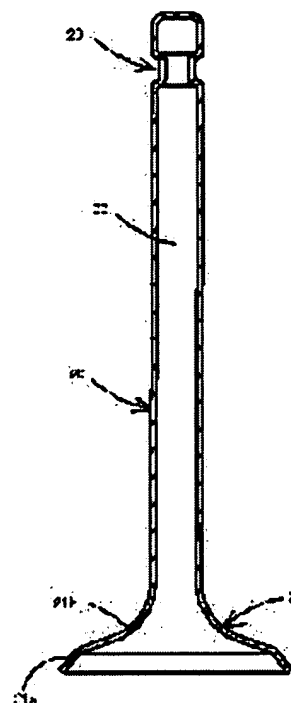
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(54) VALVE ELEMENT FOR POPPET VALVE

(57)Abstract:

PROBLEM TO BE SOLVED: To manufacture a poppet valve applied to an engine and a compressor as a suction and a discharge valve by press-forming instead of a usual forged part.

SOLUTION: A cone-shaped seating face 21a provided on a peripheral edge; a hollow stem 22; and a bevel part 21 having an about cone-shaped skirt part 21 between the two parts 21a, 22 are unitedly formed by the plastic forming with a steel plate, and the stem is also hollowly formed for reducing the inertial weight of a valve system.



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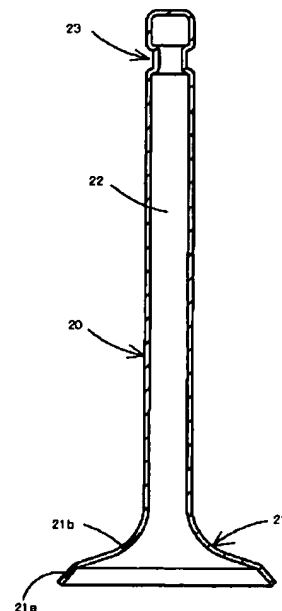
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(54) 【発明の名称】 ポベット弁の弁体

(57) 【要約】 (修正有)

【課題】 エンジンやコンプレッサに吸排気弁として使用されるポベット弁を、従来の鍛造品に代えてプレス成形によって得んとするものである。

【解決手段】 周縁に設けた円錐形の着座面21aと、中空のステム22と、その間の略円錐形のスカート部21bを有する傘部21とを、鋼板の塑性加工により一体的に成形し、そのステムも中空のステムによって成形して、動弁系の慣性重量を減じたものである。



【特許請求の範囲】

【請求項1】 周縁に設けた円錐形の着座面と、中空のステムと、その間の略円錐形のスカート部を有する傘部とを、鋼板の塑性加工により一体的に成形してなるボベットの弁体。

【請求項2】 請求項1において、前記傘部を中空のステムと共に鋼板の塑性加工により一体的に成形してなるボベットの弁体。

【請求項3】 請求項2において、前記中空のステムの傘側の端部を蓋部材により閉じたボベットの弁体。

【請求項4】 請求項2において、前記ステムを傘部側の端部が閉じる有底の中空材とし、他側に形成される開口をコック溝を備えた軸頭部材によって閉じたボベットの弁体。

【請求項5】 請求項1において、前記傘部の開口端を閉じ蓋で覆って構成したボベットの弁体。

【発明の詳細な説明】

【0001】

【産業上の利用分野】この発明はエンジン用として好適なボベットの弁体に関するものである。

【0002】

【従来の技術】従来、エンジンやコンプレッサなど、ピストンクランク式の圧縮機において使用されるボベットの弁は図6で示すように、圧縮室11へ通じる通路12の開口部に設けた弁座13と、その弁座13と協働する弁体20とからなっている。弁体20は弁座13へ着座する傘部21と、傘部21へ連なるステム22とを有し、ステム22の傘部21と反対側の端部には弁コック14とリテーナ15を介して弁ばね17を支持するための係合溝23が形成されている。そして、弁体20は一般には全体を高張力の合金鋼を鍛造して作られるが、エンジンに使用するものでは、耐熱性の向上と軽量化のため、傘側と軸側で異なる材質とすることがある。また、特殊な場合には耐熱と軽量化のため軸側を中空としてナトリウムを封入する場合もある（社団法人自動車技術会発行自動車技術ハンドブック第2分冊設計編第73頁）。

【0003】

【発明が解決しようとする課題】圧縮機に使用される弁体は、高速で往復運動をするので、弁体の軽量化は弁バネやカムフォロアなど動弁系全体の小型化と軽量化に大きく寄与するため、従来から使用される材質、構造や形状、加工方法、および熱処理など、軽量化のための研究が深く行われている。しかしながら、動弁系の軽量化には際限がなく、常に、軽量化のための技術開発が求められている。

【0004】

【課題を解決するための手段】上記課題は、周縁に設けた円錐形の着座面と、中空のステムと、その間の略円錐形のスカート部を有する傘部とを、鋼板の塑性加工によ

り一体的に成形することによって解決される。そこでは、前記傘部を中空のステムと共に鋼板の塑性加工により一体的に成形することが好ましい。また、前記中空のステムの傘側の端部を蓋部材により閉じることが一層好ましい。そして、前記ステムを傘部側端部を閉じる有底の中空材とし、その弁ばね側に形成される開口をコック溝を備えた蓋部材によって閉じて形成してもよい。また、前記傘部の開口端を閉じ蓋で覆って構成することもある。

【0005】

【作用】〔請求項1〕弁体は傘部が着座部の内側からスカートにかけて薄肉に作られ、その内面が大きく肉抜きされる。また、傘部をなす着座面からスカート部を介してステムに至る間は板材で作られているものゝ、すべて曲面で構成されているため高い剛性を備えている。

〔請求項2〕弁体は傘部のみならず、傘部からステムへ連続して肉抜きがされ、かつ、その形態は塑性加工によって成形される。

〔請求項3〕ステムは中空に作られているが、端部が蓋部材によって閉じられているため圧縮室との連結がなく、圧縮室内の容積が減じられる。

〔請求項4〕ステムの一端に形成した底部が前記蓋部材として利用される。また、コック溝が軸頭部材に作られるため、ステムを一層小径にできる。

〔請求項5〕傘部は完全に中空となり、圧縮室内の容積を減じる。

【0006】

【発明の実施の態様】以下、本願発明を図示の実施例によって説明する。図1はこの発明に係るボベットの弁10を使用したエンジン、あるいはコンプレッサなどピストンクランク形圧縮機16の要部を示す。圧縮機16はシリンダヘッドの下面に圧縮室11たる燃焼室が形成されており、弁体20は通路12としての吸気路と排気路とにそれぞれ設けられている。なお、17は弁ばねであり、リテーナ15とコック14とを介して弁体20を、常時、閉じ方向へ付勢する。18aは動弁系をなす動弁カム、18bはロッカーアーム、18cはロッカーアーム18bの支点をなす油圧式のラッシュアジャスタである。

【0007】弁体20は図2で示すように、鋼板をプレス成形して、着座面21aを含む傘部21、ステム22、および係合溝23が一体的に成形されたものである。すなわち、1枚の鋼板を深絞りしてステム22を形成し、ついで前工程の皺押えの部分（図示してない）をプレス成形して円錐台形の着座面21aと、その着座面21aをステム22へ連結する滑らかなスカート部21bとからなる傘部21を形成するとともに、ステム22の他端部には外周をスピニング加工することによって係合溝23が塑性形成されている。なお、ステム22外周の摺動面や、前記着座面21aは、従来と同様に研磨仕

上げすることはない。弁体20をかかるとの形状に成形することにより、弁体20の塑性加工による製造が容易となる他、弁体20が軽量化され、弁ばね17を細く軽いものとする事ができる他、ロッカーアーム18bなどの動弁系の部品を軽量にすることができる。

【0008】図3は弁体20の他の態様を示す。こゝではステム22の下端部を蓋部材24で閉じることによって、圧縮室11内の圧気がステム22の内面へ入り込むのを阻止して、圧縮室11内の圧縮圧力の低下を防いでいる。この態様では、ステム22のスカート部21bに近接した部分を図中、Bで示すように、若干太く成形しておき、この部分に蓋部材24を圧入し、かつ、融点が800℃以上の硬ろうによってろう付けしてある。これによって、ステム22とスカート部21bとの連続部分の応力集中を回避し、高い強度が確保される。

【0009】前記ステム22の下端部を閉じる手段は、図4で示すように、傘部21をステム22と別体とし、傘部21によって閉じることもある。こゝでは図中、Cで示すように、ステム22の下端部をなす開口部を絞って小径とし、その部分を傘部21のスカート部21bに続く環状部21cに嵌合し、前記と同様にしよう付けしてある。なお、傘部21は単独でプレス成形されており、傘部21をなす大径の開口部に端板25を当て、溶接、ろう付けによって冶金的に、あるいはかしめ加工によって塑性加工的に閉じてある。この場合、高い圧力を受ける端板25を裏面に設けたリブ25bによって補強し、あるいは、前記端板25に小径の通気孔25aを設けて、表裏の圧力差を減じることが、耐久性を高める上で有効である。また、ガス圧力が高熱であるエンジンのような場合、傘部21をステライトその他、耐熱金属を鋳造し、必要な機械加工を加えて作るのが好ましい。

【0010】ステム22は塑性加工で成形する場合上、一端が開口した形状とされるので、図2～図4の態様では、閉じた側をロッカーアーム18b側として構成してあるが、この構成は必須ではなく、図5で示すように、開口側をロッカーアーム18b側として構成してもよい。こゝでは、ステム22の底板22aのある側が、傘部21にろう付けされており、その結果、底板22aが前記蓋部材24の代用とされる。そして、ステム22の開口端には機械加工された高精密な係合溝23をもつ軸頭部材26を嵌合し、前記と同様にろう付けしてある。このようにして最少の部品で塑性成形したボベットの弁体20が得られる。

【0011】

【発明の効果】請求項1の発明によれば、傘部をなす着座面とスカート部とが、鋼板を塑性加工することにより一体的に成形され、かつ、それらは連続する曲面によって構成されるから、弁体の傘部を軽量で剛性の高いものとする事ができる。また、これをステムと結合するこ

とにより、軽量で剛性の高い弁体を得られる。請求項2の発明によれば、弁体をなす傘部とステムとが、鋼板のプレス成形によって一体的に製造されるので、従来の鍛造品のボベットの弁に比して製造が容易であり、かつ、弁体を軽量に製作することができる。その結果、動弁系の慣性質量を大幅に削減することができ、往復動機関の運転速度の上限を大幅に高速化できる。請求項3の発明によれば、中空のステムの内側と圧縮室内とが蓋部材によって遮断されるから、中抜きして軽量のステムを採用しても、それに伴う圧縮比の低下がない。請求項4の発明によれば、中空のステムの内面と圧縮室内を遮断する蓋部材としてステム自体が利用されるから、格別な部品を要しなくなり弁体の構造が簡単になる。また、ステムの軸端には開口部が残されるから、その製造に格別な困難がなく、しかもその開口部は軸頭部材の取り付けに利用され無駄がなくなる。請求項5の発明によれば、傘部が着座面とスカート部をプレス成形した形態を有するにも拘わらず、その開口部が閉じ蓋で閉じられ、圧縮室内の圧縮比を低くする不具合がなくなる。

【図面の簡単な説明】

【図1】本願発明の一実施例を示す圧縮機の断面図である。

【図2】その要部であるボベットの弁を取り出して示す軸線方向の縦断面図である。

【図3】変形例を示す図2相当の縦断面図である。

【図4】更にその変形例を示す図2相当の縦断面図である。

【図5】更にその変形例を示す図2相当の縦断面図である。

【図6】従来の圧縮機を示す図1相当の縦断面図である。

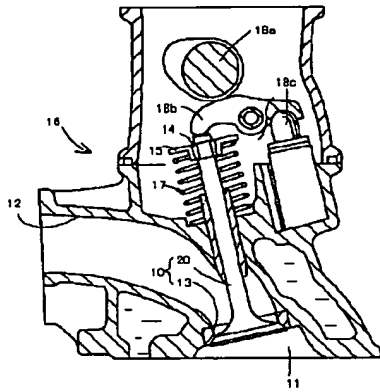
【符号の説明】

- 10 ボベットの弁
- 11 圧縮室
- 12 通気路
- 13 弁座
- 14 弁コック
- 15 リテーナ
- 16 圧縮機
- 17 弁ばね
- 18a 動弁カム
- 18b ロッカーアーム
- 18c 油圧式のラッシュアジャスタ
- 20 弁体
- 21 傘部
- 21a 着座面
- 21b スカート部
- 22 ステム
- 22a 底板
- 23 係合溝

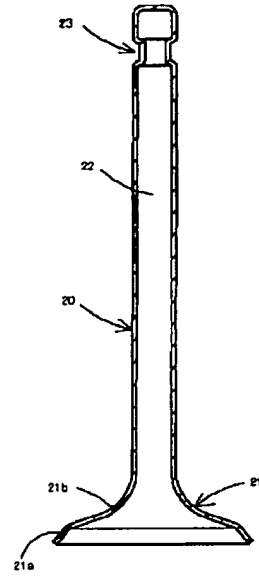
24 蓋部材
25 端板
25a 通気孔

25b リブ
26 軸頭部材

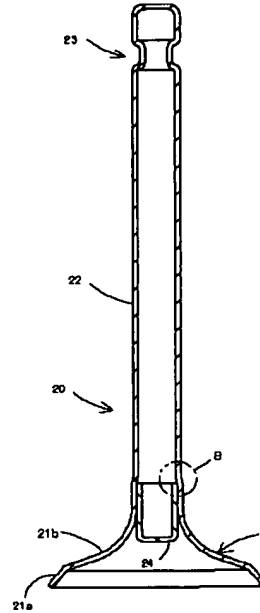
【図1】



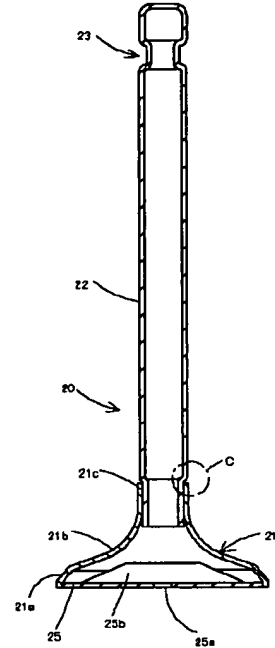
【図2】



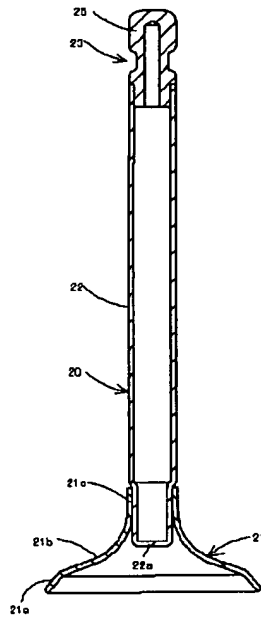
【図3】



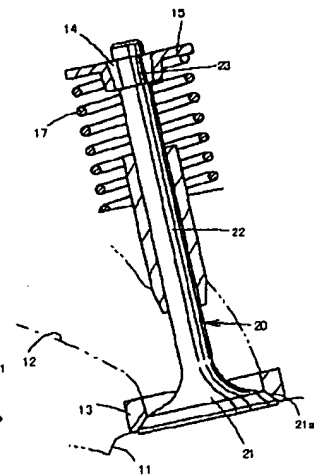
【図4】



【図5】



【図6】



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CLAIMS

[Claim(s)]

[Claim 1] The valve element of the poppet valve which comes in one to fabricate the taking-a-seat side of the cone form prepared in the periphery, a stem in the air, and the umbrella part that has the skirt-board section of approximate circle drill type in the meantime by plastic working of a steel plate.

[Claim 2] The valve element of the poppet valve which comes to fabricate said umbrella part by plastic working of a steel plate in one with a stem in the air in claim 1.

[Claim 3] The valve element of the poppet valve which closed the edge by the side of the umbrella of the stem of said hollow by covering device material in claim 2.

[Claim 4] The valve element of the poppet valve which closed opening which considers as the hollow material of the owner bottom where the edge by the side of an umbrella part closes said stem in claim 2, and is formed in the side else by the axial head material equipped with the cotter slot.

[Claim 5] The valve element of the poppet valve which closed the opening edge of said umbrella part, was covered and was constituted from a lid in claim 1.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the valve element of a poppet valve suitable as an object for engines.

[0002]

[Description of the Prior Art] Conventionally, the poppet valve used in compressors of a piston crank type, such as an engine and a compressor, consists of a valve seat 13 prepared in opening of the aeration way 12 which leads to compression space 11, and a valve element 20 which collaborates with the valve seat 13, as drawing 6 shows. A valve element 20 has the umbrella part 21 which sits down to a valve seat 13, and the stem 22 which stands in a row to an umbrella part 21, and the engagement slot 23 for supporting a valve spring 17 through the valve cotter 14 and a retainer 15 is formed in the umbrella part 21 of a stem 22, and the edge of the opposite side. And although a valve element 20 generally forges the alloy steel of high tension for the whole and is made, in what is used for an engine, it may consider as the quality of the material which is different by the umbrella and shaft side for heat-resistant improvement and lightweight-izing. Moreover, when special, sodium may be enclosed by making a shaft side hollow for a heatproof and lightweight-izing (the 2nd separate volume design section of the Society of Automotive Engineers of Japan issue automobile technical handbook the 73rd page).

[0003]

[Problem(s) to be Solved by the Invention] Since the valve element used for a compressor reciprocates at high speed, in order that lightweight-ization of a valve element may contribute to a miniaturization and lightweight-izing of the whole valve gear system, such as a valve spring and a cam follower, greatly, research for lightweight-izing of the quality of the material and structure which are used from the former, a configuration, the processing approach, heat treatment, etc. is done deeply. However, there are no limits in lightweight-ization of a valve gear system, and the ED for lightweight-izing is always called for.

[0004]

[Means for Solving the Problem] The above-mentioned technical problem is solved by fabricating in one the taking-a-seat side of the cone form prepared in the periphery, a stem in the air, and the umbrella part that has the skirt-board section of approximate circle drill type in the meantime by plastic working of a steel plate. There, it is desirable to fabricate said umbrella part in one by plastic working of a steel plate with a stem in the air. Moreover, it is much more desirable to close the edge by the side of the umbrella of the stem of said hollow by covering device material. And said stem may be made into the hollow material of the owner bottom which closes the umbrella part side edge section, and opening formed in the valve-spring side may be closed and formed by the covering device material equipped with the cotter slot. Moreover, the opening edge of said umbrella part is closed, and it may cover and may constitute from a lid.

[0005]

[Function] [Claim 1] An umbrella part applies a valve element to a skirt board from the inside of the

taking-a-seat section, it is made by thin meat, and meat omission of the inside is carried out greatly. moreover, while resulting [from the taking-a-seat side which makes an umbrella part] in a stem through the skirt-board section, ** currently made from the plate, and since all consist of curved surfaces, it has high rigidity.

[Claim 2] As for a valve element, meat omission is continuously carried out not only to an umbrella part but from an umbrella part to a stem, and the gestalt is fabricated by plastic working.

[Claim 3] Although the stem is made in midair, since the edge is closed by covering device material, there is no connection to compression space, and the volume in compression space is reduced.

[Claim 4] The pars basilaris ossis occipitalis formed in the end of a stem is used as said covering device material. Moreover, since a cotter slot is made by axial head material, a stem is made further in a minor diameter.

[Claim 5] An umbrella part serves as hollow completely and reduces the volume in compression space. [0006]

[The mode of implementation of invention] Hereafter, the example of illustration of the invention in this application explains. Drawing 1 shows the important section of the piston crank form compressors 16, such as an engine which used the poppet valve 10 concerning this invention, or a compressor. As for the compressor 16, the 11 casks of compression space combustion chamber is formed on the inferior surface of tongue of the cylinder head, and the valve element 20 is formed in the inhalation-of-air way and exhaust air way as an aeration way 12, respectively. In addition, 17 is a valve spring and always energizes a valve element 20 in the direction of closing through a retainer 15 and a cotter 14. The valve train cam with which 18a makes a valve gear system, and 18b are a rocker arm and a hydraulic rushes adjuster with which 18c makes the supporting point of rocker-arm 18b.

[0007] A valve element 20 carries out press forming of the steel plate, as drawing 2 shows, and the umbrella part 21 containing taking-a-seat side 21a, a stem 22, and the engagement slot 23 are fabricated in one. Deep drawing of the steel plate of one sheet is carried out, a stem 22 is formed and, subsequently press forming of the part (not shown) of wrinkle prevention of a last process is carried out. Namely, taking-a-seat side 21a of a truncated-cone form, While forming the umbrella part 21 which consists of smooth skirt-board section 21b which connects the taking-a-seat side 21a with a stem 22, plastic formation of the engagement slot 23 is carried out by carrying out spinning of the periphery to the other end of a stem 22. In addition, neither the sliding surface of stem 22 periphery nor said taking-a-seat side 21a needs to say carrying out polish finishing as usual. By fabricating a valve element 20 in this configuration, manufacture by plastic working of a valve element 20 becomes easy, and also a valve element 20 is lightweight-ized, a valve spring 17 can be made [thin] light, and also the components of valve gear systems, such as rocker-arm 18b, can be made lightweight.

[0008] Drawing 3 shows other modes of a valve element 20. In ****, by closing the lower limit section of a stem 22 by the covering device material 24, it prevented that the compressed air in compression space 11 entered to the inside of a stem 22, and the fall of the compression pressure in compression space 11 is prevented. The part close to skirt-board section 21b of a stem 22 is thickly fabricated in this mode a little, as B shows among drawing, the covering device material 24 is pressed fit in this part, and the melting point is soldered by brazing solder 800 degrees C or more. The stress concentration of the continuation part of a stem 22 and skirt-board section 21b is avoided, and high reinforcement is secured by this.

[0009] As drawing 4 shows, as for the means which closes the lower limit section of said stem 22, it is also effective to use an umbrella part 21 as a stem 22 and another object, and to close by the umbrella part 21. In ****, as C shows among drawing, opening which makes the lower limit section of a stem 22 is extracted, and it considers as a minor diameter, fits into annular section 21c which follows skirt-board section 21b of an umbrella part 21 in the part, and has soldered like the above. In addition, there is an umbrella part 21 in metallurgy, it is in it, it is made for press forming to be carried out independently, to apply an end plate 25 to opening of the major diameter which makes an umbrella part 21, and to put it on by welding and soldering, and is closed in plastic working by processing. In this case, it is effective to reinforce the end plate 25 which receives a high pressure by rib 25b prepared in the rear face, or to

prepare air hole 25a of a minor diameter in said end plate 25, and to reduce the differential pressure of a front flesh side, when raising endurance. Moreover, case [whose gas pressure is / like the engine which is high temperature], it is desirable to cast Stellite, others, and a heat-resistant metal for an umbrella part 21, and to add and make required machining.

[0010] Since a stem 22 is made into the configuration in which the end carried out opening for the sake of the convenience fabricated by plastic working, the closed side is constituted from a mode of drawing 2 - drawing 4 as a rocker-arm 18b side, but this configuration is not indispensable, and as drawing 5 shows, it may constitute an opening side as a rocker-arm 18b side. In ****, the side with bottom plate 22a of a stem 22 is soldered at the umbrella part 21, consequently bottom plate 22a is considered as substitution of said covering device material 24. and the high energy machined by the opening edge of a stem 22 -- the axial head material 26 with the dense engagement slot 23 is fitted in, and it has soldered like the above. Thus, the valve element 20 of the poppet valve which carried out plastic shaping with the minimum components is obtained.

[0011]

[Effect of the Invention] According to invention of claim 1, when the taking-a-seat side and the skirt-board section which make an umbrella part carry out plastic working of the steel plate, it is fabricated in one, and since they are constituted by the continuous curved surface, they are lightweight and can make [rigid] the umbrella part of a valve element high. Moreover, by combining this with a stem, it is lightweight and a rigid high valve element is obtained. Since the umbrella part and stem which make a valve element are manufactured in one by press forming of a steel plate according to invention of claim 2, as compared with the poppet valve of the conventional forging, manufacture is easy and can manufacture a valve element lightweight. Consequently, the inertial mass of a valve gear system can be reduced sharply, and the upper limit of the operating speed of a reciprocating engine can be accelerated sharply. According to invention of claim 3, since the inside of a stem in the air and the inside of compression space are intercepted by covering device material, even if it carries out extraction and adopts a lightweight stem, there is no fall of the compression ratio accompanying it. According to invention of claim 4, since the stem itself is used as covering device material which intercepts the inside of the inside of a stem in the air, and compression space, it stops requiring exceptional components and the structure of a valve element becomes easy. Moreover, since opening is left behind to the axis end of a stem, there is no exceptional difficulty in the manufacture, the opening is used for installation of axial head material, and the futility of it is lost. In spite of having the gestalt to which the umbrella part carried out press forming of a taking-a-seat side and the skirt-board section according to invention of claim 5, the opening closes, it is closed with a lid, and the fault which makes the compression ratio in compression space low is lost.

[Translation done.]

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TECHNICAL FIELD

[Industrial Application] This invention relates to the valve element of a poppet valve suitable as an object for engines.

[Translation done.]

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PRIOR ART

[Description of the Prior Art] Conventionally, the poppet valve used in compressors of a piston crank type, such as an engine and a compressor, consists of a valve seat 13 prepared in opening of the aeration way 12 which leads to compression space 11, and a valve element 20 which collaborates with the valve seat 13, as drawing 6 shows. A valve element 20 has the umbrella part 21 which sits down to a valve seat 13, and the stem 22 which stands in a row to an umbrella part 21, and the engagement slot 23 for supporting a valve spring 17 through the valve cotter 14 and a retainer 15 is formed in the umbrella part 21 of a stem 22, and the edge of the opposite side. And although a valve element 20 generally forges the alloy steel of high tension for the whole and is made, in what is used for an engine, it may consider as the quality of the material which is different by the umbrella and shaft side for heat-resistant improvement and lightweight-izing. Moreover, when special, sodium may be enclosed by making a shaft side hollow for a heatproof and lightweight-izing (the 2nd separate volume design section of the Society of Automotive Engineers of Japan issue automobile technical handbook the 73rd page).

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EFFECT OF THE INVENTION

[Effect of the Invention] According to invention of claim 1, when the taking-a-seat side and the skirt-board section which make an umbrella part carry out plastic working of the steel plate, it is fabricated in one, and since they are constituted by the continuous curved surface, they are lightweight and can make [rigid] the umbrella part of a valve element high. Moreover, by combining this with a stem, it is lightweight and a rigid high valve element is obtained. Since the umbrella part and stem which make a valve element are manufactured in one by press forming of a steel plate according to invention of claim 2, as compared with the poppet valve of the conventional forging, manufacture is easy and can manufacture a valve element lightweight. Consequently, the inertial mass of a valve gear system can be reduced sharply, and the upper limit of the operating speed of a reciprocating engine can be accelerated sharply. According to invention of claim 3, since the inside of a stem in the air and the inside of compression space are intercepted by covering device material, even if it carries out extraction and adopts a lightweight stem, there is no fall of the compression ratio accompanying it. According to invention of claim 4, since the stem itself is used as covering device material which intercepts the inside of the inside of a stem in the air, and compression space, it stops requiring exceptional components and the structure of a valve element becomes easy. Moreover, since opening is left behind to the axis end of a stem, there is no exceptional difficulty in the manufacture, the opening is used for installation of axial head material, and the futility of it is lost. In spite of having the gestalt to which the umbrella part carried out press forming of a taking-a-seat side and the skirt-board section according to invention of claim 5, the opening closes, it is closed with a lid, and the fault which makes the compression ratio in compression space low is lost.

[Translation done.]

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Since the valve element used for a compressor reciprocates at high speed, in order that lightweight-ization of a valve element may contribute to a miniaturization and lightweight-izing of the whole valve gear system, such as a valve spring and a cam follower, greatly, research for lightweight-izing of the quality of the material and structure which are used from the former, a configuration, the processing approach, heat treatment, etc. is done deeply. However, there are no limits in lightweight-ization of a valve gear system, and the ED for lightweight-izing is always called for.

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MEANS

[Means for Solving the Problem] The above-mentioned technical problem is solved by fabricating in one the taking-a-seat side of the cone form prepared in the periphery, a stem in the air, and the umbrella part that has the skirt-board section of approximate circle drill type in the meantime by plastic working of a steel plate. There, it is desirable to fabricate said umbrella part in one by plastic working of a steel plate with a stem in the air. Moreover, it is much more desirable to close the edge by the side of the umbrella of the stem of said hollow by covering device material. And said stem may be made into the hollow material of the owner bottom which closes the umbrella part side edge section, and opening formed in the valve-spring side may be closed and formed by the covering device material equipped with the cotter slot. Moreover, the opening edge of said umbrella part is closed, and it may cover and may constitute from a lid.

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OPERATION

[Function] [Claim 1] An umbrella part applies a valve element to a skirt board from the inside of the taking-a-seat section, it is made by thin meat, and meat omission of the inside is carried out greatly. moreover, while resulting [from the taking-a-seat side which makes an umbrella part] in a stem through the skirt-board section, ** currently made from the plate, and since all consist of curved surfaces, it has high rigidity.

[Claim 2] As for a valve element, meat omission is continuously carried out not only to an umbrella part but from an umbrella part to a stem, and the gestalt is fabricated by plastic working.

[Claim 3] Although the stem is made in midair, since the edge is closed by covering device material, there is no connection to compression space, and the volume in compression space is reduced.

[Claim 4] The pars basilaris ossis occipitalis formed in the end of a stem is used as said covering device material. Moreover, since a cotter slot is made by axial head material, a stem is made further in a minor diameter.

[Claim 5] An umbrella part serves as hollow completely and reduces the volume in compression space. [0006]

[The mode of implementation of invention] Hereafter, the example of illustration of the invention in this application explains. Drawing 1 shows the important section of the piston crank form compressors 16, such as an engine which used the poppet valve 10 concerning this invention, or a compressor. As for the compressor 16, the 11 casks of compression space combustion chamber is formed on the inferior surface of tongue of the cylinder head, and the valve element 20 is formed in the inhalation-of-air way and exhaust air way as an aeration way 12, respectively. In addition, 17 is a valve spring and always energizes a valve element 20 in the direction of closing through a retainer 15 and a cotter 14. The valve train cam with which 18a makes a valve gear system, and 18b are a rocker arm and a hydraulic rushes adjuster with which 18c makes the supporting point of rocker-arm 18b.

[0007] A valve element 20 carries out press forming of the steel plate, as drawing 2 shows, and the umbrella part 21 containing taking-a-seat side 21a, a stem 22, and the engagement slot 23 are fabricated in one. Deep drawing of the steel plate of one sheet is carried out, a stem 22 is formed and, subsequently press forming of the part (not shown) of wrinkle prevention of a last process is carried out. Namely, taking-a-seat side 21a of a truncated-cone form, While forming the umbrella part 21 which consists of smooth skirt-board section 21b which connects the taking-a-seat side 21a with a stem 22, plastic formation of the engagement slot 23 is carried out by carrying out spinning of the periphery to the other end of a stem 22. In addition, neither the sliding surface of stem 22 periphery nor said taking-a-seat side 21a needs to say carrying out polish finishing as usual. By fabricating a valve element 20 in this configuration, manufacture by plastic working of a valve element 20 becomes easy, and also a valve element 20 is lightweight-ized, a valve spring 17 can be made [thin] light, and also the components of valve gear systems, such as rocker-arm 18b, can be made lightweight.

[0008] Drawing 3 shows other modes of a valve element 20. In ****, by closing the lower limit section of a stem 22 by the covering device material 24, it prevented that the compressed air in compression space 11 entered to the inside of a stem 22, and the fall of the compression pressure in compression

space 11 is prevented. The part close to skirt-board section 21b of a stem 22 is thickly fabricated in this mode a little, as B shows among drawing, the covering device material 24 is pressed fit in this part, and the melting point is soldered by brazing solder 800 degrees C or more. The stress concentration of the continuation part of a stem 22 and skirt-board section 21b is avoided, and high reinforcement is secured by this.

[0009] As drawing 4 shows, as for the means which closes the lower limit section of said stem 22, it is also effective to use an umbrella part 21 as a stem 22 and another object, and to close by the umbrella part 21. In ****, as C shows among drawing, opening which makes the lower limit section of a stem 22 is extracted, and it considers as a minor diameter, fits into annular section 21c which follows skirt-board section 21b of an umbrella part 21 in the part, and has soldered like the above. In addition, there is an umbrella part 21 in metallurgy, it is in it, it is made for press forming to be carried out independently, to apply an end plate 25 to opening of the major diameter which makes an umbrella part 21, and to put it on by welding and soldering, and is closed in plastic working by processing. In this case, it is effective to reinforce the end plate 25 which receives a high pressure by rib 25b prepared in the rear face, or to prepare air hole 25a of a minor diameter in said end plate 25, and to reduce the differential pressure of a front flesh side, when raising endurance. Moreover, case [whose gas pressure is / like the engine which is high temperature], it is desirable to cast Stellite, others, and a heat-resistant metal for an umbrella part 21, and to add and make required machining.

[0010] Since a stem 22 is made into the configuration in which the end carried out opening for the sake of the convenience fabricated by plastic working, the closed side is constituted from a mode of drawing 2 - drawing 4 as a rocker-arm 18b side, but this configuration is not indispensable, and as drawing 5 shows, it may constitute an opening side as a rocker-arm 18b side. In ****, the side with bottom plate 22a of a stem 22 is soldered at the umbrella part 21, consequently bottom plate 22a is considered as substitution of said covering device material 24. and the high energy machined by the opening edge of a stem 22 -- the axial head material 26 with the dense engagement slot 23 is fitted in, and it has soldered like the above. Thus, the valve element 20 of the poppet valve which carried out plastic shaping with the minimum components is obtained.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the sectional view of the compressor in which one example of the invention in this application is shown.

[Drawing 2] It is drawing of longitudinal section of the direction of an axis taking out and showing the poppet valve which is the important section.

[Drawing 3] It is drawing of longitudinal section of drawing 2 showing a modification.

[Drawing 4] Furthermore, it is drawing of longitudinal section of drawing 2 showing the modification.

[Drawing 5] Furthermore, it is drawing of longitudinal section of drawing 2 showing the modification.

[Drawing 6] It is drawing of longitudinal section of drawing 1 showing the conventional compressor.

[Description of Notations]

10 Poppet Valve

11 Compression Space

12 Aeration Way

13 Valve Seat

14 Valve Cotter

15 Retainer

16 Compressor

17 Valve Spring

18a Valve train cam

18b Rocker arm

18c A hydraulic rushes adjuster

20 Valve Element

21 Umbrella Part

21a Taking-a-seat side

21b Skirt-board section

22 Stem

22a Bottom plate

23 Engagement Slot

24 Covering Device Material

25 End Plate

25a Air hole

25b Rib

26 Axial Head Material

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CORRECTION OR AMENDMENT

[Kind of official gazette] Printing of amendment by the convention of 2 of Article 17 of Patent Law
[Section partition] The 1st partition of the 5th section
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[Procedure revision]
[Filing Date] September 3, Heisei 13 (2001. 9.3)
[Procedure amendment 1]
[Document to be Amended] Specification
[Item(s) to be Amended] Claim
[Method of Amendment] Modification
[Proposed Amendment]
[Claim(s)]
[Claim 1] The valve element of the poppet valve which comes in one to fabricate the taking-a-seat side of the cone form prepared in the periphery, a stem in the air, and the umbrella part that has the skirt-board section of approximate circle drill type in the meantime by plastic working of a steel plate.
[Claim 2] The valve element of the poppet valve which comes to fabricate said umbrella part by plastic working of a steel plate in one with a stem in the air in claim 1.
[Procedure amendment 2]
[Document to be Amended] Specification
[Item(s) to be Amended] 0004
[Method of Amendment] Modification
[Proposed Amendment]

[0004]

[Means for Solving the Problem] The above-mentioned technical problem is solved by fabricating in one the taking-a-seat side of the cone form prepared in the periphery, a stem in the air, and the umbrella part that has the skirt-board section of approximate circle drill type in the meantime by plastic working of a steel plate. There, it is desirable to fabricate said umbrella part in one by plastic working of a steel plate with a stem in the air.

[Procedure amendment 3]

[Document to be Amended] Specification

[Item(s) to be Amended] 0005

[Method of Amendment] Modification

[Proposed Amendment]

[0005]

[Function] [Claim 1] An umbrella part applies a valve element to a skirt board from the inside of the taking-a-seat section, it is made by thin meat, and meat omission of the inside is carried out greatly. moreover, while resulting [from the taking-a-seat side which makes an umbrella part] in a stem through the skirt-board section, ** currently made from the plate, and since all consist of curved surfaces, it has high rigidity.

[Claim 2] As for a valve element, meat omission is continuously carried out not only to an umbrella part but from an umbrella part to a stem, and the gestalt is fabricated by plastic working.

[Procedure amendment 4]

[Document to be Amended] Specification

[Item(s) to be Amended] 0011

[Method of Amendment] Modification

[Proposed Amendment]

[0011]

[Effect of the Invention] According to invention of claim 1, when the taking-a-seat side and the skirt-board section which make an umbrella part carry out plastic working of the steel plate, it is fabricated in one, and since they are constituted by the continuous curved surface, they are lightweight and can make [rigid] the umbrella part of a valve element high. Moreover, by combining this with a stem, it is lightweight and a rigid high valve element is obtained. Since the umbrella part and stem which make a valve element are manufactured in one by press forming of a steel plate according to invention of claim 2, as compared with the poppet valve of the conventional forging, manufacture is easy and can manufacture a valve element lightweight. Consequently, the inertial mass of a valve gear system can be reduced sharply, and the upper limit of the operating speed of a reciprocating engine can be accelerated sharply. There is which effectiveness.

[Translation done.]